

Claims

1. A method for the optical detection of the spatial shape of bodies and body parts with partly non-visible regions, characterized in that
 - for the optical detection of the spatial shape of bodies and body parts 5 (10) with at least one 3D digitizer (2) at least one shape-retaining measurement aid (16; 18; 21) is positively mounted to the body parts not visible for and not measurable by the 3D digitizer such that said measurement aid protrudes into the measurement space visible for the 3D digitizer (2), wherein on at least some points of its parts located in the visible measurement space said measurement 10 aid (16; 18; 21) is provided with marks to be evaluated by the 3D digitizer, and wherein these marks are located in a known spatial position with respect to the remaining parts of the measurement aid;
 - the spatial position and the marks of this part of the measurement aid visible for the 3D digitizer are determined together with the spatial shape of the 15 remaining, visible body regions;
 - geometrical information such as height, angle, circumference, curvature and the like of the non-visible body regions are determined from the measured spatial position of the visible part of the measurement aid; and
 - this information is used for supplementing the description of the spatial 20 shape digitized incompletely because of the non-visible regions.
2. The method as claimed in claim 1, characterized in that the measurement aid (16) is made of a rigid material which is fixed at the non-visible body region such that the spatial position of this body region can be calculated from the 3D digitization of the marked part of the measurement aid (16) 25 protruding into the measurement space.
3. The method as claimed in claim 2, characterized in that the rigid measurement aid (16) has an oblong shape and is bent upwards at one end thereof.
4. The method as claimed in claim 2 or claim 3, characterized in that the 30 rigid measurement aid is fastened by pressing onto a bone, the spatial

coordinates being determined for an anatomical part which is located under adipose tissue.

5. The method as claimed in claim 1, characterized in that
 - the marked measurement aid (18; 21) is cuff-like and reaches around the
- 5 visible and non-visible parts of an approximately cylindrical, only partly visible body part, wherein the circumference of the measurement aid is adjusted such via a marked belt (19; 22) that it closely rests against the approximately cylindrical body, and the position of the marked belt (19; 22) is chosen such that it protrudes into the visible measurement space; and
- 10 - from the common 3D digitization of the body part, the measurement aid (18; 21) and the marked belt (19; 22), the circumference of the body part at the point of the measurement aid is determined.
6. The method as claimed in claim 1, characterized in that the marked measurement aid is a molded ring mechanically adaptable to the approximately cylindrical body part to be digitized by deformation and/or by changing the diameter.
- 15 7. The method as claimed in claim 6, characterized in that
 - the marked molded ring is at least partly made of a semiplastic material;
 - prior to 3D digitization is manually molded onto the spatial shape of the
- 20 non-visible, approximately cylindrical body part to be digitized; and
 - upon being molded maintains this spatial shape at least for the duration of the 3D digitization.
8. The method as claimed in any of claims 1 to 7, characterized in that the body part (10) to be digitized is a stump which is digitized together with the
- 25 measurement aid.
9. The method as claimed in any of claims 1 to 7, characterized in that the body part to be digitized is a body part to be dressed with a compression textile, which is digitized together with the measurement aid.
10. The method as claimed in any of claims 1 to 9, characterized in that

- the body to be digitized or the body part (10) to be digitized is clothed with an elastic, tightly fitting cover which reveals marks to be evaluated by photogrammetry;
- the part of the measurement aid which protrudes into the measurement space to be detected by the 3D digitizer (2) reveals marks to be evaluated by photogrammetry, these marks being designed such that they can be distinguished from those of the elastic cover by the methods of image processing and/or photogrammetry; and
- the marked measurement aid is digitized photogrammetrically together with the visible body regions.

11. An arrangement for performing the method as claimed in any of claims 1 to 10, characterized in that the arrangement comprises:

- a body or a body part (10) with partly non-visible regions;
- a rigid measurement aid (16; 18; 21) with marks to be evaluated by photogrammetry, which is positively mounted on at least one of the non-visible regions of the body/body part (10);
- an optical 3D digitizer (2) which detects the spatial shape of the visible body regions and at least one visible part of the measurement aid;
- a computer (3) to which the spatial coordinates are provided, which the 3D digitizer determines for the visible regions of the body or body part (10) as well as for the visible part of the measurement aid (16; 18; 21), wherein the computer (3) determines geometrical information concerning the height, angle, circumference, curvature and the like of the non-visible body regions from the stored spatial shape of the measurement aid, the known position of the marks of the measurement aid with respect to the part of the measurement aid fixed at the non-visible body part, and from the spatial position of the visible parts of the digitized body or body part, and uses this geometrical information for completing the spatial shape digitized incompletely because of the non-visible regions.